Faculty of Physical Education and Sport UK

Department of Physiotherapy

Cervicobrachial Syndrome

Bachelor Thesis

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DEDICATION

To my Mom, and Dad, who missed the whole thing

But always have been there for me

To my Professors in Prague

To

My family and friends who supported me

To my supervisor

To whom ever trusted on me

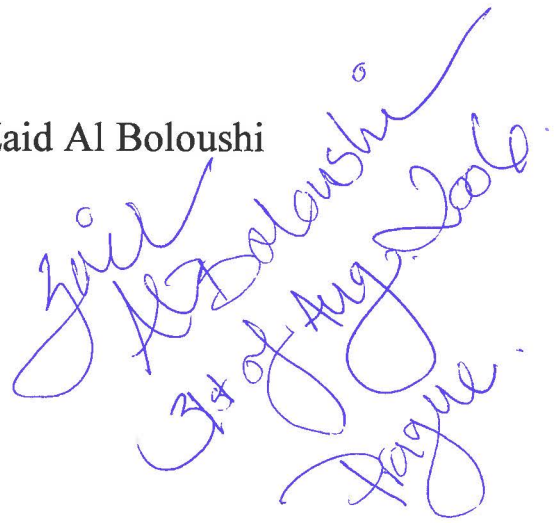
To me whom I turn the

Dream to come true.

DECLARATION

I declare that, this is my personal work which I elaborated using the literature listed and the knowledge I gained throughout my studies at Charles University, in the department of Physiotherapy.

Zaid Al Boloushi



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Furthermore, special thanks to my patient for her cooperation understanding and kindness, during my practice.

Contents:

1. Preface

Main goal of the program of therapeutic exercises for patients with Cervicobrachial syndrome is to achieve motion and functional movements without restriction of any kinds such as pain. Restoration of disability and return of patient back to his/her normal life. World's Health Organization defines health as "*A state of complete physical, social and mental wellbeing and not merely the absence of disease or infirmity*" (1). Health is a resource for everyday life, not the object of living. Furthermore, health is considered as a fundamental human right.

For the most effective application of a therapeutic exercise in a patient, therapist should have knowledge about the basic principles and effect of exercise in musculoskeletal, neuromuscular, cardiovascular and respiratory system. In addition, the therapist should be able to provide an efficient assessment of the patient (physically and psychologically), should know the correlation of anatomy and kinesiology of the treated area and understand the condition of the injury, pathology or surgical approach as well as the possible rhythm of recovery, complication, preventions and contraindications.

Our spine is one of the most important parts of our body. It gives our body structure and support. Without it we could not stand up or keep ourselves upright. It allows our to move about freely and to bend with flexibility. The spine is also designed to protect our spinal cord. The spinal cord is a column of nerves that connects our brain to the rest of our body. Allowing us to control our movements. Without the spinal cord we could not move any part of our body, and our organs could not function. Keeping a healthy spine is a vital if we want to live an active life.

2. GENERAL PART

The spine column generally includes 33 vertebrae; 7 cervical, 12 thoracic, 5 lumbar, which are flexible with multiple articulation.

2.1 Anatomy of the cervical spine

Vertebrae

The first seven vertebrae in the spine column constitute the cervical spine. The first two; the atlas and the axis are quite distinct. Where as the third through to the seventh are quite similar and share much the same description.

Located at the top of the spinal columns, they support the least amount of weight. The vertebral body is relatively small as compared to the vertebral arch and the spinal canal. The superior surface of the vertebral body is concave, although its lateral edges turn upward forming the uncinate processes. The inferior is convex; it slopes downward from back to front. (7, 18).

The transverse processes in the cervical spine are quite distinct. Emanating from the vertebral body and the root of the pedicle is a rudimentary rib forming the anterior tubercle of the transverse process that lies more posterior. Together the vertebral body, the anterior tubercle, two transverse processes, and the costotransverse lamella form a ring, the transverse foramen. More laterally the anterior tubercle and the true transverse process, together with the vertebral body, form the lateral walls of the groove, through which passes the ventral ramus of each spinal nerve. As seen through the rest of the vertebral column, the inferior and superior components of this groove are formed by the superior pedicles. (7, 18).

Immediately posterior to the transverse process and the transverse foramen are the articular processes. In the articulating cervical spine, these articular processes meet to form posterolateral bony columns. Together with the vertebral bodies it is apparent that the cervical spine is stacked in the configuration of bony tripod. (1)

The laminas of the cervical spine are thin and meet posteriorly to form the spinous process. The third, fourth and fifth cervical vertebrae usually have bifid spinous processes; those of the sixth and seventh vertebrae singular and progressively longer, the

largest being C-7, which is also called the vertebra prominence. The seventh cervical vertebra is a transition vertebra. (7, 18).

The atlantoaxial complex (C-1 and C-2) can also be seen as transitional vertebrae. Although appearing grossly quite distinct, they have all the feature of typical vertebrae. The inferior surface of the axis (C-2) is similar to the other cervical vertebrae. The transverse process is heavy as well and includes the transverse foramen but dose not have an anterior tubercle. (7, 18).

The upper half of the atlas has a very different morphology, the superior facet face upward and outward and is slightly convex. They are relatively large to support the axis and the cranium. Most distinctive, however, is the anterior vertebral body, which projects upward in the form of the odontoid process, the body of the first cervical vertebra. The odontoid process or dens have a somehow a narrow base and project superiorly to the level of foramen magnum. The dens are faceted anteriorly where it articulates with the posterior aspect of the anterior arch of the atlas. (7, 18).

The atlas too has an irregular shape but includes most of the elements of the lower cervical vertebrae with the exception of a true vertebral body. Which it borrow from C-2 in the form of a dens. The overall width of the atlas is greater than the other cervical vertebrae to accommodate articulations with the occiput superiorly. The lateral masses actually include both the pedicles and the articular pillars. The superior articular facets face upward and internally and are concave to accept the occipital condyles. The inferior facets face downward, and internally to articulate with the axis. The larger inferior facets transverse the spinal canal's diameter at this level. (7, 18).

Protruding somewhat into the spinal canal are two bony prominences that give rise to the transverse ligament, which maintains the dens in the anterior one third of the canal. The transverse processes have no costal elements. There is no transverse foramen; the vertebral arteries pass up from C-2 and progress posteriorly around the lateral masses in a groove toward the posterior arches. (7, 18).

Ligaments and Intervertebral discs

Although the vertebrae provide the bony support and protection of the spinal column, the ligaments and intervertebral discs allow the stability and flexibility of the cervical spine. The anterior and posterior longitudinal ligaments course the entire length of the spine and are its major stabilizers. The anterior longitudinal ligaments are comprised of a series of strong fibers that interconnect the anterior surfaces of the vertebral bodies. It is narrowest at the cervical spine but becomes gradually wider throughout its course. From the level of the axis it extends upward and attaches to the atlas and becomes connected with the anterior atlanto-occipital membrane. Where it attaches to the vertebral body it forms part of periosteum, its strongest adherence being at the anterior lip of the body. It is only loosely attached to the intervertebral disc. (7, 18).

The Intervertebral discs are smallest at the level of the cervical spine. They are comprised of four parts: nucleus pulposus at the center of the disc surrounded by the annulus fibrousus and bounded at the vertebral surfaces by two cartilaginous end-plates. Unlike other levels of the spine, cervical discs appear more closely surrounded by bone. The concave superior surface and convex inferior surface of the cervical vertebrae appear to hold it closely in place. The upper projection of the superior surface of the vertebrae also creates a lip: The Uncus, which interfaces with the inferior surface of superior vertebrae called the echancrure. Overtime, probably due to degenerative changes, the uncus and the echancrure form the uncovertebral joints referred to as the joints of Lushka. (7, 18).

In the area of the vertebral arches are numerous ligaments. In the level of the cervical spine the supraspinous ligaments are board and are termed the ligamentum nuchae. They extend from the vertebra prominens at C-7 to external occipital protuberance and are a major stabilizer of the head and the cervical spine. Deep fibers attach to each of the spinous processes. Deep ligamentum nuchae are the interspinous ligaments that connect adjoining spinous processes. The ligamenta flava are highly elastic and are important stabilizers in flexion. (7, 18).

The fibers are highly elastic so as not to cause buckling and compression of the dura when relaxed. The ligamenta flava attach to the anterior surfaces of the vertebral arch of the superior margin of the laminae of the inferior vertebra. They are bilateral and merge

with the interspinous ligaments posteriorly and in the fibrous capsule of the synovial joint anteriorly, the facet joints are true synovial joints with fibrous capsules. (7, 18).

The ligaments of the cervicocranium are quite different and specialized. From the level of the axis, the anterior longitudinal ligament runs cranially, attaching to the anterior arch of the atlas. The occipital membrane runs to the occiput anterior to the foramen magnum. The posterior longitudinal ligament becomes part of the tectorial membrane, which passes over the odontoid and affixes to the occiput at the level of the hypoglossal canals inside the skull. Deep to the tectorial membrane is the crurla ligament, which contains the transverse ligament. The transverse ligament extends across the anterior aspect of the atlantal ring running along the facet on the odontoid process. Longitudinal bundles extending from the transverse ligament course the odontoid process inferiorly and superiorly. (7, 18).

Accessory atlantoaxial ligaments run out from base of the dens upward to the lateral masses of the atlas. The apical ligament runs from the apex of the dens to the anterior rim of the foramen magnum. The dens are further fixed to the foramen magnum by the alar ligaments coursing from the dens to the lateral margins of the foramen magnum. True synovial joints exist between the dens and the atlas and the occipital condyles and the atlas. (7, 18).

2.2 Dynamics of the Lower Cervical Spine

The lower cervical spine has been investigated with reference to both the maintenance of the neutral posture and to its responses to various functional stresses.

I. The theory of opposed pyramids and the dynamic modalities of the lower cervical spine. (17)

In a schematic representation of the spinal column as a whole, the spine could be thought of as a structure made of two truncated pyramids with opposite vertices and an inters posed fulcrum (discs L 3–L 4–L 5). (17)

The upper pyramid—to which the head and the upper limbs both converge—represents predominantly the dynamic part of the system, since it is controlled mostly by muscles. The lower pyramid stiffer—prevalently controlled by ligaments, is instead intended to distribute loads to the lower limbs. Obviously the theory of opposed pyramids is just a graphic representation of the work of the spinal column as a whole. It is not intended to overcome the idea of *motor segment* which, in a metameric vision of the spine, fully preserves its validity. From a strictly anatomical-functional point of view, we regard as valid the distinction, on a longitudinal plane, between fore vertebral section (discs, vertebral bodies, fore and hinder longitudinal ligaments) and hinder vertebral section (facet joints, vertebral arches and hinder ligaments). The two sections regulate the vertebral work in a different way through their fundamental anatomical-functional structures. (17)

The nucleus polposus is a pre-compressed hydraulic chamber at the same time the bearing system of the axial loads and the pivot of the inter-vertebral movement.

The posterior joints are the sliding track of the movement. The neuromuscular control system is the real starter of the movement and controls its initiation; the propioceptives nervous impulses from the CNS in fact control the condition of the changes in muscular work during the various kinematics movements. (17)

The lower cervical spine is therefore one of the most important anatomical & functional areas of the of the neck. (17)

In fact from the anatomical point of view we notice the following characteristics: the vertebral bodies have the same morphology; spatial arrangement and the shape of the facet joints are almost the same; the intervertebral discs are nearly the same size and ligaments and muscles are some how in common. From a dynamic point of view, this means that for all the motor segments, the kinetic modalities of the sector are the same, and over all the work produced is of one type and interchangeable. (17)

Concerning the quantity of work made by each motor segment in the pyramid, there are specific differences from anatomical point of view. (17)

The upper cervical spine and the thoracic spine take also part in such a movement but with smaller potentiality. (17)

In conclusion, the dynamic behavior of the lower cervical spine may be compared to that of a fulcrum in a flexible system and with stiffer ends in relation to the central part C4-C6 which is more mobile, as far as sagittal movements are concerned. (17)

II. The functional interdependence between lower and upper cervical spine. (17)

In a dynamic analysis of the lower cervical spine the posture of the upper cervical spine is not to be neglected; during the movement in fact, the posture of the upper cervical spine play an important role in cooperation with the rest of the lower cervical spine. *According to the authors* (17) *point of view they say that: "since the C1-C2 has a small rotatory movements that are unnoticeable when we compare it with the rotatory movement on C4 through the rest of the spine".*(17)
According to Czech school & university's we learned that: "the C1-C2 cervical spine hasn't a small rotatory movement" in compare with the author.

It condition the dynamic function of the lower cervical spine in such functional interdependence has been summarized in four points: (17)

1- The ventral flexion is much bigger if the upper cervical spine start firstly then the lower cervical will follow the cervical spine will bends sequentially. (17)
2- The rotatory movement of the lower cervical spine takes place only after that C 1 has rotated round C 2. *According to the Autho*(17). *"But from my point of view the rotatory movement start on (C1 through C2").*
3- When the head is turned or bended, the flexion of the cervical spine is smaller in the upper part. (17)
4- Extension movements without any involvement from the upper cervical spine (i.e. without bending or stretching the head), result in the lower cervical spine bending and the upper cervical spine stretching. While stretching the neck, the lower cervical spine stretches and the upper cervical spine bends. (17)

III. The functional interference between lower cervical spine and biological status of the lower cervical spine. (17)

In the lower cervical spine the possibility and the range of motion depend on the biological status of the capsules, discs, and ligaments muscles surrounding, which usually affect the segments of the lower cervical spine which leads of course to structural changes in motoric segment leads to deformities and inflammatory reaction and changes, which results in set of symptoms so called cervicobrachial syndrome. The presence of local neurological symptoms of Cervico-Brachial syndrome are irradiating of pain to corresponding dermatome, sensitivity defect in certain dermatome. Reduction of muscular strength, muscular hypotension, hypo-reflection or a- reflection. Segments C5-6 and C6-7 predominate in general practice. This area presents the most stressed locus and so it shows as a functional instability of musculoskeletal system which is corresponding with the pyramidal triangle and the anatomical structures of the respective area. And later on, after long overloading in incorrect position it results in structural changes and consequential radicular irritation. (17)

2.3 Stability of the Lower Cervical Spine and muscular relationship

The stability of the cervical spine has been defined as maintenance of normal vertebral alignment under physiological loads. The ligaments of the cervical spine appear to be responsible for stability under test conditions which usually involve stressing two spinal segments in various directions. These passive elements do not actively position or support the cervical spine under conditions of normal use. (20)

The ligamentous anatomy of the neck is familiar to most workers in this field, but a brief review of the anatomy of the muscles will be in order. (See fig 1,2).

In respect to the posterior extensor muscles of the cervical spine we can divide them into three groups: (20)

1. The m. splenii. 2. The m. erector spinae. 3. The m. posterior erector spinals muscles. (20)

The trapezius and levator scapulae muscles, while attached to the cervical spine, are considered muscles of the upper limb even though they are highly affecting the cervical spine.

The deepest muscles layers are the transversospinalis muscles including the interspinalis muscles, multifidi and intertransversarii. (20)

In flexion and extension, the vertebrae move about centers rotation which is probably in the anterior-inferior part of the vertebral body. The arc of motion is defined by radii from the center of rotation to the arc of the facet joints. (20)

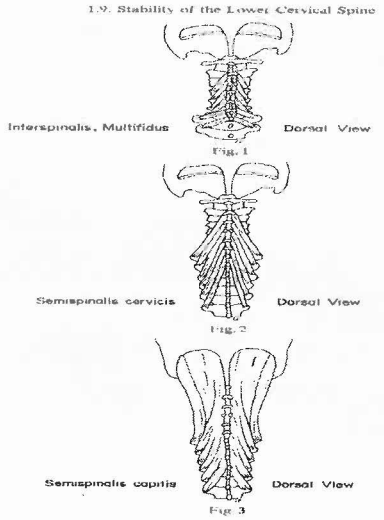
The extreme of flexion appears limited by passive tension on the inter-spinous ligament, ligamentum nuchae, facet joint ligaments, posterior longitudinal ligament and the posterior annulus fibrosis. (20)

Under physiological conditions when the cervical spine and head are in full flexion and the passive restraints under full tension, the effect of contraction of the interspinalis and multifidus muscles can be demonstrated mathematically by shortening the distances between the spinous processes and laminae. (20)

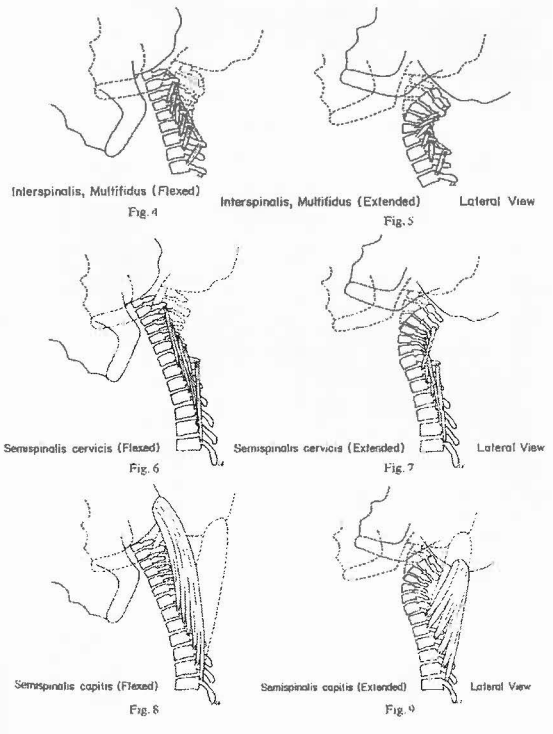
The neck from C2-C7 is thereby shortened and stiffened. It is converted to a rigid lever arm, the position of which can be further refined by tension generated in the cervicis , inserting primarily into the bifurcated spinous processes of C2-C7. (20)

The prominence of the spinous processes of cervical two and cervical seven seem significant in this regard. They overhang the smaller spinous processes of the adjacent vertebrae. This bifurcated projection provides for posts on which a large muscular semispinalis cervicis can act advantageously in modulating the degree of extension of the lower cervical spine and positioning the lever arm of cervical two through cervical seven for adjustment of head position. (20)

Stability and position of the head, in turn appear to be relatively independent of the stability and position of the neck. Therefore, once the multifidi, interspinalis and semispinalis cervicis components of the transversospinalis muscles have stabilized and positioned the subaxial cervical spine, the occipital musculature places the head in an additional degree of extension seemingly independent of lower back position. It should be noticed that the semispinalis capitus has very powerful muscles extending from the mid and lower thorax proximally to a large area on the occiput. This will lead to creating a greater tension on the neck. (20)



(Figure: 1)Dorsal view: m.interspinalis, m.multifius is the top, then the middle picture shows m.semispinalis cervicis, and the lower picture is m.semispinalis Capitis. (20)



(Figure: 2) The lateral view of the cervical spine and the muscles which provide flexion and extension of the cervical spine (20)

2.4 The connection between scapula & the cervical spine

The scapula is connected to the axial system indirectly through the acromioclavicular joint (the possibility for movement is high and the passive stability is low). Muscle co-operation, joint connection and external forces can cause actual position of the scapula. The main functional connection of the scapula to the trunk is by muscles. (3)

Physiotherapy specialists use term the "muscle disbalance" in situations where some muscles are weaker and the others are stronger in the same region. It demonstrates during movement and for the rest muscle tense. We can presuppose that the observed rest position of the scapula depends on the muscle balance (on the cooperation of resting muscles) in this functional area. (3)

There are no generally accepted conventions for describing the position of the scapula on the thorax. Terms such as protraction, retraction, and winging are useful in describing types of movement, but do not lend themselves to the definition of positions. A method of describing scapulothoracic positions and motions is needed to help us understand how the scapula functions during motions. (3)

We observed on the human trunk surface by optical major topography the medial margo of the scapula. (Markers are situated on the inferior angulus and on the margo medialis point of initiation of the spina scapulae)(2). We view the right and left scapulas "laterality", which means the distance of inferior angulus in regards to medial plane; its "latero-lateral shift" vertically towards to vertebra C7 and the "angle of margo medialis" to the vertical line of the inferior angulus. (3)

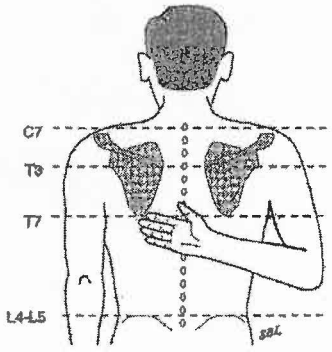
The plan biomechanical model of static force system was prepared in order to solve the problem of comparable internal muscle forces distribution in this region, which includes only muscles connected to the axial system . (3)

Morphological data, including the geometry of bones and muscles and the muscle physiological cross-sectional area, were obtained from anatomical atlases. (3)

Through simulating the positions of the scapula by analysis, the major investigations were detected. The activity of superior and inferior parts of m. trapezius and m. serratus anterior are typical in situation of retraction of the scapula usually connected with upward (it is internal) rotation (minimal laterality and maximal angle of margo medialis). External rotation of the scapula (minimal angle of margo medialis) is caused by superior part of mm. rhomboidei. We can find connection of depression (max cranio-caudal shift) of the scapula and higher activity of m. serratus. (3)

To find relationship between **chosen position** of the **scapula** ➢ **and ascertained higher activity of some of the** considered muscles A) Retraction of the scapula usually connected with internal rotation *(minimal laterality and maximal angle of margo medialis)* ➢ superior **and inferior parts of m. trapezius** **B)** External rotation of the scapula *(minimal angle of* margo *medialis)* ➢ superior **part of mm. rhomboidei** C) Depression of the scapula *(max cranio-caudal shift)* ➢ m. serratus

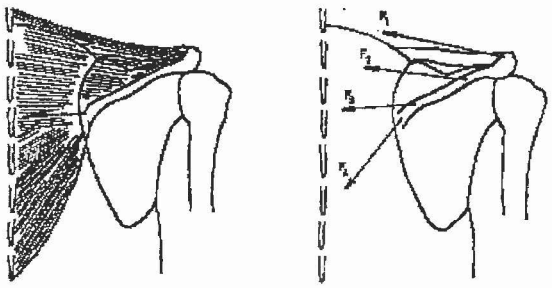
Table: 1. Results of simulations of scapula biomechanical model (3)



(Figure: 3) Position of the scapula depend on joint, ligament and muscle functional affection and on position of other segments. (3)

Muscle stress is one of the physical variables that the central nervous system wishes to minimize. This criterion does not uniquely define the patterns of muscle activation. It fails to explain the degree of co-activation of muscle antagonists that is widely found, and it cannot explain why two movements or movement segments that follow an identical trajectory driven by identical joint torques can be driven by different patterns of muscle activation. (3)

Functional position of m. trapezius in shoulder movement complex has special attributes. One is high range of agency for stabilization and movement of the shoulder blade and specifically for scapula. Further m. trapezius constitute of three functionally independent portions. Moreover it lies in surface level of chest muscles, so it is possible to investigate its functional. (3)

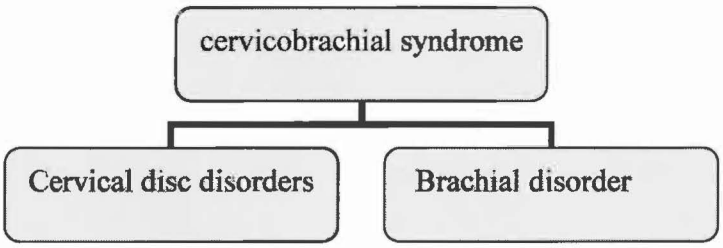


(Figure: 4) the m. trapezius has complex effect on to scapula position and functional behavior of whole upper arm. (3)

2.5 Cervicobrachial syndrome

The Cervico-brachial syndrome is characteristic by diffuse pain irradiating from neck spine to upper limb in projection to certain dermatomes. Cervical spine pain followed by neurological symptoms from the compression of the nerve roots , usually resulting from the stenosis of neuro-canal or the prolepses of the discus.

Specification of the Cervicobrachial syndrome:



Cervical Disc Disorders:

Cervical disc disorders such as degeneration, spur formation and herniation can put pressure on the spinal nerve roots and create severe pain. The majority of cervical disc disorders occur at the upper cervical spine but not obvious by the X-rays. More or less it's often in the lower cervical spine at the level of C-5 or C-6 since they are the most mobile cervical vertebrae. (2, 16)

Symptoms:

Symptoms in cervical disc disorders can occur with sudden, acute pain or with onset over a period of time. Particularly with slower onset, the patient may have experience with stiffness in the neck; pain that is exacerbated by cough, sneeze, straining or arm extension; numbness in the arm or hand; tingling of the fingers; headache; and decreased range of motion in the neck, shoulder or arm. (2, 16)

Spinal stenosis

Spinal stenosis is the narrowing of the spinal canal. Stenosis can be discogenic or non-discogenic. It is important to note that pain, neuritis, radiculitis and discogenic cervical stenosis are considered to be symptoms of the disease process of herniated disc. (2, 16)

Herniated disc

Although it is often called a slipped disc, the terms ruptured disc, herniated disc, herniated nucleus pulposus or soft disc protrusion are more accurate names for the same condition since very rarely does the disc itself slip out of place. Instead, a herniated disc occurs when a mass of nucleus pulposus (the soft, elastic center of the disc) bulges out. This bulge puts pressure on the nerve root and causes severe radicular pain. Usually the herniated discs work in this degree:

Bulging→ protrusion → prolapsed which in the end its lead us to sequester. (2, 16)

Spondylosis

The type of cervical disorder that occurs more frequently in older patients is known as hard disc lesion or spondylosis. In this condition, the disc space narrows and some osteo-arthritis of the joints occurs. Oste-ophytes (bone spurs) tend to form causing pressure on the spinal cord and may produce upper extremity pain and possible lower extremity weakness. (2, 16)

Myelopathy

we notice that the cervical degeneration, spondylosis all include a fourth or fifth digit selection to indicate myelopathy.

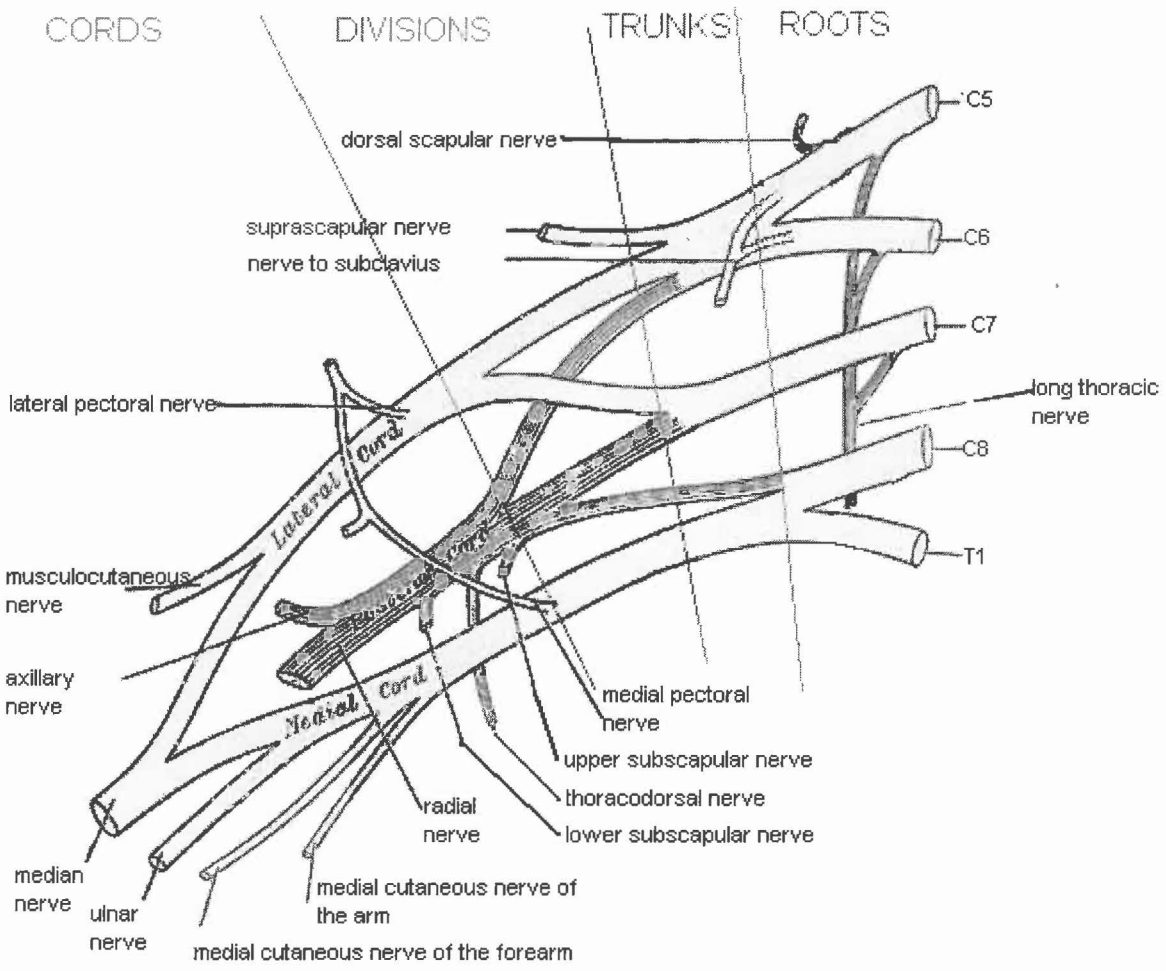
Myelopathy is spinal cord compression and the pathological changes that can result from it. (2, 16)

Whiplash

Whiplash (sometimes called whiplash syndrome) is the name given to cervical injury due to a sudden and hyper flexion or hyper extension movement of the neck. The sudden movement causes severe strain on the cervical ligaments and results in stiffness and pain. (2, 16)

Brachial Plexuses:

A network of nerves located in the neck and axilla, composed of the anterior branches of the lower four cervical and first two thoracic spinal nerves and supplying the chest, shoulder, and arm. (2, 16)



(Figure:5) shows the brachial plexus (15)

2.6 Injuries and problematic Causes of the pain:

The most common causes of damage of brachial plexus are physical injury. An accident that pulls the arm or severely bends the arm at the shoulder may damage the brachial plexus.

A cancer growing in the upper part of the lung can march into and destroy the brachial plexus. Other masses, such as a noncancerous (benign) tumor, an abscess, or a collection of blood (hematoma), may also cause plexus disorders by putting pressure on a plexus.

A plexus may be damaged when the body produces antibodies that attack its own tissues—an autoimmune reaction. Acute brachial neuritis (a sudden malfunction of the brachial plexus) is probably caused by an autoimmune reaction. This disorder occurs primarily in men. It typically occurs in young adults but can occur at any age. And of course in all different ages through youngsters to adolescences and eldary patient we have the main muscles disbalance which lead us to have cervicobrachial syndrome. (14)

Child birth and Erb's palsy:

During child birth there is a possibility that the birth of the child will include some difficulties such as Erb's palsy. Erb's palsy is weakness or paralysis of the shoulder and arm caused by injury to the upper roots of baby's brachial plexus during birth, excess traction applied to the head damages the fifth cervical root of the spinal cord. The muscles of the shoulder and the flexors of the elbow are paralyzed and the arm hangs at the side internally rotated at the shoulder. Recovery may be spontaneous, but in some cases nerve grafts or muscle transfers are required (13)

2.7 Differential diagnosis:

Table: 2 Radicular Vs. Pseudoradicular syndrome. (6, 16).

Radicular Syndrome	Pseudoradicular Syndrome
Follows one dermatome	Dose not respect dermatomes
Sharp pain	Diffused pain
Muscle (Motor) weakness	Normal muscle power *(Not much expressed).
Superficial sensation is defected	Normal sensation
Deep sensation may be defected (If the intervertebral disc presses the spinal cord , extra pressure even central signs such as spacticity may appear)	Normal deep sensation
Hyporeflexia	Normal reflexes

Cervicobrachial Syndrome - causes pain, numbness, and/ or tingling from the neck, down the arm and to the hand. Most commonly results from overly tight muscles on the side of the neck compressing all or part of the Brachial Plexus.

Nerve Root Compression - Depending on which nerve roots and how many are compressed, you could have symptoms in the whole arm (colored area) or just "strips" of pain, numbness, and/or tingling similar to the pictures above. Only a doctor trained and specializing in nerve entrapment syndromes can tell the difference. (2, 16)

Cervical Subluxations - Even a minor misalignment of a vertebra or "stuck joints" in your neck can cause muscle spasms and/or pressure on nerves that go to the arm resulting in pain, numbness and tingling. This condition is very common and can only be corrected by a chiropractic adjustment. If left untreated, degeneration can occur with the formation of bone spurs and disc bulges, which can result in persistent problems. (2, 16)

Thoracic Outlet Syndrome –

Results from the compression of nerves and/or blood vessels as they travel from the neck under the collar bone (clavicle) and down into the entire arm. Can cause cold hands, brittle fingernails, numbness, severe soreness, or "burning" pain in the hands all the way up to the shoulder. Can also cause shooting pain, numbness and tingling. There are several types of thoracic outlet syndrome (meaning the compression can occur in different areas). (2, 16)

Double Crush Syndrome - results from compression of any of the nerves mentioned in two or more places. Most commonly, these compressions or "crushes" to the nerves occur in the neck and one (or more) entrapment site(s) somewhere in the arm. You may or may not have neck pain. Typically just one of the compression sites alone is not enough to cause the symptoms, but add just one more area of tightness on that same nerve and then you've got a problem. Fixing the arm compression could cause a return of symptoms soon after as the problem in the neck gets worse. Your doctor must always evaluate your neck whenever you have arm problems. (Symptom area shown is a Double Crush of the Median Nerve). (2, 16)

2.8 Treatment

Always treat the primary cause with main aim on the general coordination. This may involve also treatment of the secondary symptoms (muscles spasm, joint block etc) but the main aim is the primary cause and the correction of the functional abnormal position of the segments.

Acute Phase

Rehabilitation program:

Physical therapy: little is known about the natural history of cervicobrachial syndrome or controlled randomized studies comparing operative versus non-operative treatment.

Initial treatment should be directed at reducing pain and inflammation. Treatment can begin with local icing, non-steroidal anti-inflammatory drugs (NSAIDs), and reducing the forces compressing the nerve root by relative rest, avoiding positions that increase arm and/or neck symptoms, manual traction, and if necessary, mechanical traction.

In addition , a cervical collar also can be used for patient comfort and some support. A cervical pillow at night can be helpful in maintaining the neck in a neutral position and limiting head positions, which cause narrowing of the neuroforamen. Manual, and if necessary mechanical traction can be used to reduce the pain and the symptoms, by decreasing foraminal compression and intradiscal pressure. Mobility's, such as electrical stimulation, also have been found helpful in uncontrolled studies. Mobility's appear to be helpful in reducing the associated muscles pain and spasm often found with cervical problems but should be limited to the initial pain control phase of treatment. (4, 19).

Other treatment:

Cervical epidural steroids have been used in patients who have not respond to medications, traction, and a well-designed physical therapy program. When properly performed by experienced physicians under fluoroscopic guidance, a significant number of patient respond when other treatment have not helped. Selective nerve root blocks can be helpful in patients with electro diagnostically demonstrated single roots lesions.

Acupuncture has been used on cervicobrachial syndrome with some success. This can be if pain control is not achieved with physical therapy and medications or in conjunctions

with these treatments. In addition, acupuncture can be tried instead of cervical epidural injections in patients who hesitant or wish not to process with this procedure. (4,8,19)

Recovery phase

Rehabilitation program:

Once pain and inflammation are controlled, the patients therapy should be progressed to restoration of full range of motion (ROM), and flexibility of the neck and shoulder girdle muscles. Post isometric relaxation (PIR) technique can be used in order to remove trigger points and muscles spasms. Propioceptive neuromuscular facilitation (PNF) can be used to relax strength the muscles.

Joint play mobilization and traction can remove the blockage of the joints. Various soft tissue techniques of the skin, connective tissue and fascia can be used.

Instruction of the patient on the corrective sitting way according to *Brugger.*

Proper auto-stretching and auto-mobilization techniques which they can complete 1-2 times per day should be instructed.

Gentle prolonged stretching is recommended. Antigravitation relaxation (AGR) techniques can be used for self stretching..

As ROM and flexibility improve, cervical muscles stretching should begin with isometric strengthen in a single plane and include flexion, extension, lateral bindings and rotation. In addition, the scapular stabilizing muscles including the m. trapezius middle & lower part, m.rhombodei, m. serratus anterior, and m. latisssimus dorsi should be strengthened with progressive isotonic activity. Strength training can progress to manual resistive cervical stabilization exercise in various planes. All exercise should be performed without pain, although some degree of post exercise soreness can be expected.

Patient should be encouraged to self exercise and improve physical status of his/her cardiovascular fitness as much as possible throughout the rehabilitation program.(4,9,10,12,13,14,16,19)

Surgical Interventions

Due to the broad spectrum of brachial plexus injuries, it is difficult to estimate the rate of spontaneous recovery. The potential for spontaneous recovery depends on the type and severity of injury. Therefore prognosis must be assessed for each patient individually based on the type and severity of their injury and the progression of any spontaneous recovery that may be occurring.

Serial physical examinations and diagnostic studies play a key role in tracking the progression of recovery. After a few months surgery is indicated if there is no recovery or if recovery has plateaued at an unacceptable functional level.

Surgical intervention serves two functions: confirmation of diagnosis and repair of injury. Several factors determine the type of intervention performed including: preoperative diagnosis, interval between injury and surgery, and intraoperative diagnosis.

The determination of whether the surgery was successful is usually not made until enough time has passed for complete re-innervations and strengthening (about 1.5 to 2 years). Recovery may continue to occur for up to four years. If there is incomplete recovery, patients should be evaluated for the further interventions. These may include muscle or tendon transfers or releases to optimize movement of the limb. (6), (8), (14).

Maintenance phase

Physical therapy:

Patients should be independent in a stretching and strengthen program and continue with these exercises under supervision of a physiotherapist or an athletic trainer. Initially and then complete on their own, Emphasis is placed on starching the anterior neck and shoulder muscles groups and strengthening the neck and scapular muscles. If completed correctly, proper head and neck positioning is then maintained in everyday activity and sports. (4,16,19).

3. SPECIAL PART

My practice was done at the Military Hospital for 2 weeks. From 16th of January, until the 31st of January 2006. I was practicing with Mrs.Musilkova; we decided to meet the patient 3 times per week.

3.1. Anamnesis

Patient: L.K, female 1933

Present medical diagnosis: 723.3 Cervicobrachial syndromes

Family anamnesis:

The father had hypertension and he died from brain stroke on 2000, the mum she was healthy, but passed away in 2003. She had 2 sons, one is 50 years old and the other one is 47 years old. Both are healthy.

Personal anamnesis:

Childhood disease: The typical childhood disease.

Injuries: No.

Operations: Hysterectomy in 1985. During the operation the surgeons had some complications, the operation was successfully done and the healing took process without any complications.

Abuses: Non smoker, she drinks alcohol on occasions.

Pharmacological anamnesis: Ibuprofen 400 mg, Aescin, prescript from the physician to stop the pain from the cervicobrachial syndrome.

Allergies anamnesis: Antibiotics, Anaspaz (Inhibition the muscarinic effect of acetylcholine in smooth muscles, secretory glands and the CNS).

Salines (Essential for the activity of many enzymes, play an important role in neurotransmission and muscular excitability).

Subjective findings:

Description of the pain:

The pain intensity of the cervical region was elevated, the pain was sharp like a needles runs downwards from the shoulder to the wrist. The pain is continues none stop; there is no relationship with any kind of headache, visible, auditory disturbances.

Easing factors:

The analgesic pills had an effect on the pain, the pain was slightly decreased.

Severity and irritability of Symptoms:

The patient is able to tolerate the pain by holding her left shoulder in a relieving position which is; internal rotation.

24 hour behavior of symptoms:

The pain is sharp and tender in the morning, she often wakes up in the night, the patient sleeps on her back to avoid any movement that causes pain, and she uses 2 pillows to avoid the pain, by moving her neck forward.

Professional anamnesis:

She used to work as a nurse for many hours. Now she is retired, but she is occupied with housekeeping. She performed her work at home by her self. Her dominant hand is right and she wears glasses because of presbyopia.

Social anamnesis:

She is married. She lives with her husband in an apartment on the 4th floor, left is available. She has neither special hobbies nor sport activity. She practices normal daily walking.

Present complication by the physician:

She has been suffering from severe chronic pain on the cervical spine region after hydrotherapy in the spa. She has been evaluated by physician on the 04.01.2006, physician diagnosed a cervicobrachial syndrome. On the 09.01.2006 she was diagnosed with Cervicalalgeia, C.B Sy., spondylodegenration changes and radicular symptoms.

Laboratory data and other investigations studies:

Roentgen (x-ray) images:

It was made on the 5th of Jan 2006.

Findings:

C-spine + foramina, there is osteochondrosis of disc C5, C6 with sign's of arthrosis and diminishing of foramina C5, C6 bilaterally to one half.

CT-Scan:

It was made on the 5th of Jan 2006.

Findings:

Visible stenosis of C3, C4 on both bilateral sides. But more evident on the left side and C5, C6 bilaterally, it shows more in the left side. Escalating the level of spondylosis and spondylarthrosis of the cervical spine, diminishing of the disc in all surfaces more obvious in C5, C6.

Conclusion: Great degenerative changes of the spine with stenosis of foramina.

Previous physiotherapy:

She started to visit the spa's (Frantiskovy Lazne, Teplice, and Lazne Belohrad) from the year 1997, for rehabilitation and treatment of her arthrosis of the knee, pelvis, hip and low back pain

3.2 Differential considerations

The patient does not have serious hereditary diseases according to the family anamnesis. According to the personal history, medical and laboratory investigations, the patient does not have any internal organs disease. Only orthopedic problems were presented. These problems are mostly related, to her previous job as a (nurse), and her obesity. The problems were hidden due to the combination of house work and occupation and it was waiting to get provoked after her retirement. The primary causes of the problem are mainly from the degenerative findings of the cervical region and with combination of the arthrosis of the knee, pelvis, and hip. The secondary cause could be as well the lumbar part of the spine which is with years of compensation of the other parts of the spine. This could finally result to mechanical changes of the cervical part of the spine. This is only a conclusion after the anamnesis. Further examinations and tests are necessary and they will be performed.

Present status:

The patient feels stiffness of the neck. The pain has been spreading to the scapular region; she feels pain on the left shoulder during the daily activities. At night she wakes up due to the pain several times a night.

3.2.1 Objective findings

(Initial kinesiology examinations): 16.01.2006

Standing evaluation

Weight: 88kg

Height: 160cm

Body mass index: 34.4

Table: 3 Standing evaluation- anterior view:

Sole weight bearing	Symmetrical
Flat transversal sole arch	Normal
Flat longitudinal sole arch	Positive dex , sin
Symmetry of the calf (tibial side)	Symmetrical
Symmetry of the calf (fibular side)	Symmetrical
Patella, knee	Valgoid knee: Bilaterally ER of the knee: 0 IR of the knee: 0
Symmetry of thigh contour	Symmetrical in both sides(medio-lateral)
Anterior superior iliac spine	Symmetrical
Umbilicus	Slight deviation sin.
Sternum	Middle line
Nipples	Symmetrical
Clavicles	Symmetrical
Shoulder position	Normal position on dex. Depression on sin. Dominant hand: dex.
Head position	Middle line

Table: 4 standing evaluation- posterior view:

Heel form and position	Symmetrical
Achilles tendon contour	Symmetrical
Achilles tendon thickness	Symmetrical
Calf	Symmetrical
Popliteal lines	Symmetrical
Thigh contour	Symmetrical in both sides (medio-lateral)
Subgluteal lines	Symmetrical
Posterior superior iliac spine	Symmetrical
Illium crest	Symmetrical
Trunk latroflexion	Dextro concave
Symmetry of spinous processes	Symmetry of the whole spine without any deviations
Inferior scapula angles	Lower dex.
Scapulas medial margin Scapula alata	Abducted bilat. Positive, bilat.
Shoulder position	Normal position on dex. Depression on sin.
Auricles	Symmetrical

Table: 5 standing evaluation-side view:

Knee joint position	Hyperextension sin. Hyperextension dex.
Position of pelvis	Ante version
Lumbar part of spine	Hyperlordosis the peak in (L2-L3)
Thoracic part of spine	Hyperkyphosis the peak in (Th7-Th8)
Shoulder position	Protraction, bilaterally
Cervical part of spine	Hyperlordosis, prominence of C7.
Head position	Protraction , forward-drawn position

Conclusion from the BMI:

According to the body mass index the patient is obese.

Conclusion from standing evaluation:

According to anterior view of the patient there were pathological findings that were: the shoulder protraction and the longitudinal flat foot, with the combination of the posterior view and the lateral view, there were more pathological findings, the presence of scapula alata bilaterally, the depression of the left shoulder. Which leads me to test the muscle strength of mm. rhomboidei major & minor, m.trapezius upper, lower & middle part and m.serratus anterior. According to the side view, the hyperextension of the knees might be due to the pelvis position with a combination of the hyperlordosis of the lumbar part; it could lead us to test the m.rectus abdominis, m. biceps femoris, m.gluteus maximus & medius, illiopsoas, and m.erector spine. The hyperkyphosis in thoracic part of spine might be compensation mechanism due to lumbar hyperlordosis or cervical hyperlordosis or the opposite, further examinations are necessary in order to find the primary cause. Shoulder protraction lead me in muscle shortening test of m.pectoralis minor & pectoralis major bilaterally. The cervical hyperlordosis and head protraction lead me to test the muscle strength and shortening of m.sternocleidomastoideus, m.scalenii & to test suboccipital muscles, sternocledomastoid, scalenii, short cervical extensors, m.trapezius upper part and m.leavator scapule.

3.2.2 Dynamic test evaluation

Romberg test: I –negative, II – negative, III – negative

Trendelenburg test: positive bilaterally.

Examination of the spine (global test):

Table: 6 Distance of the spine:

Stibors distance	10 cm, norm is: (7-10 cm)
Schobers distance	5 cm, norm is: (4-6 cm)
Froestiers distance	5 cm, positive, the patient has to touch the wall with the occiput.

Cepoje's distance	1 cm, positive, Normal is (3-4 cm)
Otto's inclination distance Otto's reclination distance	2,5 cm, positive 0,5 cm, positive Result is summing these two findings normal is 4.5 cm.
Thomyer's distance	40 cm, positive, (Normal is touch the ground)
Latero-flexion distance	R 12 cm, positive, Normal is (20cm) L 10 cm, positive

Examinations of basic moving patterns:

The examinations of basic moving patterns were provided according to *Vladimir janda*

Extension in hip joint:

Pathological sign: The motion starts with activation of lumbar erector muscles on ipsilateral side, continues with contra lateral side, then activation of gluteal muscles and hamstrings appears, and at the end ThL erectors are activated.

Abduction in hip joint:

Physiological.

Trunk curls up:

Pathological sign: Curling movement of the trunk is minimal and the movement performed with an almost straight back and anterior tilting of the pelvis. The movement performed by the hip joint than by kyphosis of the trunk.

Shoulder abduction:

Pathological sign bilaterally: The movement starts with a great activity of m.trapezius, followed by deltoid and supraspinatus which are activated at the same time.

Push up: Pathological sign: During this test winging of the scapula occurs (Scapula alata) bilaterally.

Conclusion from dynamic examination of the spine:

It is visible from the measurement of distances of spine that the mobility in all parts of the spine is restricted.

Conclusion from the examination of basic movement patterns:

Inhibition of m.gluteus maximus according to hip extension basic moving pattern (BMP), weakness of m.rectus abdominis according to trunk curl up (BMP), shortening of m.scalenii according to head flexion (BMP), Discoordination of muscles of the shoulder girdle, abduction starts with great activity of m.trapezius. Weakness of m.rhombodei, m.serratus anterior, m.trapezius middle and lower part according to push up BMP.

3.2.3 Gait evaluation

Stride length: symmetrical

Step length: symmetrical

Stride width: large base

Pelvis rotation: No pelvis rotation.

Pelvis shift: Yes, physiological shift.

Nutation movement: No nutation movements

Trunk movement: No trunk movements

Arm sinkinesis: No arm sinkinesis (Pathological position)

Shoulder sinkinesis: Right leg-left shoulder flexion, left leg-right shoulder flexion without normal rhythm and without any rotation.

Conclusion from gait evaluation

Patient's gait is irregular; side deviation was there with no rhythm. Walking starts with heel strike phase, foot flat, heel off, good quality of toe off, knee bending is normal, pure and good quality of dorsal flexion, and return to heel strike phase again with the same rhythm and quality. The hyperextension of lower extremities in hip joint was eliminated – inhibition and weakness of gluteus maximus might be present.

3.2.4 Goniometry

Table: 7a, 7b, 7c, 7d, 7e: Goniometry of active movement:

(a)

Dx.	**Shoulder joint**	**Sin.**
180°	Flexion	160°
60°	Extension	30°
180°	Abduction	100°
0	Adduction	0
90°	Internal rotation	70°
90°	External rotation	90°

(b)

Dx.	**Head rotation**	**Sin.**
40°	Latroflexion	40°
60°	Rotation	60°

(c)

Head Flexion	30°
Head Extension *	----------

Notes: ** The measurement of range of motion in head extension was not performed because it was contraindicated from the doctors.*

(d)

Dx.	**Elbow joint**	**Sin.**
140°	Flexion	140°
0	Extension	0

(e)

Dx.	Wrist	Sin.
70°	Extension	70°
80°	Flexion	80°
45°	Ulnar deviation	45°
20°	Radial deviation	20°

Conclusion from the goniometrical examination:

The range of motion (ROM) in the left shoulder joint is restricted in all directions; also the range of motion of the head flexion and rotation is restricted.

3.2.5 Neurological examination:

Cranial Nerve: I-XII: *Without pathological findings.*

Level of consciousness: *Conscious, she is oriented by time, place, and personality.*

Intellect: *Normal, without impairment.*

Personality: *No fear, cooperative, normal behavior.*

Complex sensory functions: *No dysfunctions.*

Performance of complex acts: *No dysfunctions.*

Language: *Listening and talking is normal.*

Speech: *Is normal.*

Handwriting: *Is normal. No tremor during writing.*

Upper extremities

Table: 8 Superficial sensations:

Touch	Without pathological findings, same sensation on both sides
Hot	Without pathological findings, same sensation on both sides
Cold	Without pathological findings, same sensation on both sides
Tactile	Without pathological findings, Hypoesthesia on thumb on left upper extremity
Sensations on the dermatomes.	Without pathological findings, Hypoesthesia on C5-C6 dermatome on the left upper extremity. The rest is without pathological findings.

Table: 9 Deep sensations:

Vibration, (elbow & finger tips)	Without pathological findings, same sensation in both sides
Sensation of position (elbow flexion)	Without pathological findings,
Sensation of movement (wrist flexion)	Without pathological findings,

2-Point-discrimination test:

Positive in left upper extremity, she wasn't able to distinguish a diameter of 1 cm on her left upper extremity.

Mingazzini test of the arms (pseudo root pyramidal): Negative, she was able to hold her hands.

Table: 10 (Tendon reflexes):

Biceps brachii reflex	Hyporeflexia(2) on left upper extremity
Triceps brachii reflex	Hyporeflexia (2) on left upper extremity
Brachioradialis reflex	Hyporeflexia (2) on left upper extremity
Pronator reflex	Hyporeflexia (2) on left upper extremity
Flexion of fingers reflex	Hyporeflexia (2) on left upper extremity

The right upper extremity is normal without any pathological findings.

Lower extremities:

The neurological examination of lower extremities bilaterally has negative findings. No neurological defects are presents. The superficial sensation, deep sensation and the tendon reflexes are normal without pathological findings bilaterally.

Conclusion of neurological examination

We have very important findings from this examination. Hypoesthesia on the left thumb, and on C5-C6 dermatome. Also, hyporeflexia on biceps brachii reflex, on Brachioradialis, Pronator reflex and flexion of the fingers reflex on the left side. Suspicion of lesion, at C5-C6 level (C6 root).

3.2.6 Palpation examination:

Table: 11: Palpation examination:

Dx		**Sin**
	m. trapezius	
Painful, hyper tonus	upper part	Painful , hyper tonus
Trigger points (TrP)		Trigger points (TrP)
Normal tonus	middle part	Normotonus
Normal tonus	lower part	Normotonus
Normotonus	m. biceps brachii	Hypotonus
Normotonus	m. sternocleodomastoideus	Normotonus
Hypertonus, TrP	m. levator scapulae	Hypertonus , TrP
Normotonus	m. deltoideus	Hypotonus
Hypertonus	m. pectoralis minor	Hypertonus
Hypertonus	m. pectoralis major	Hypertonus
Normotonus	m. teres minor	Hypertonus
Normotonus	m. supraspinatus	Painful, hypertonus
Normotonus	m. infraspinatus	Hypertonus
Normotonus	m. subscapularis	Hypertonus
Hypotonus	m. gluteus maximus	Hypotonus
Hypertonus	m. erector spine	Hypertonus
Hypertonus	m. latisssimus dorsi	Hypertonus

m. rectus abdominis	Hypotonus
m. transversus abdominis	Hypotonus
m. obliques abdominis (internal & external)	Hypotonus

Skin drag examination: During the examination of the skin drag in cervical area, hyperalgic zones (HAZ) were found in the upper part of m. trapezius, m. levator scapulae and m. suboccipitals.

Connective tissue examination: During the examination of connective tissue in whole back and cervical area, adhesion of the connective tissue in the upper part of m. trapezius is present.

Examination of fascia: During the examination of the fascia, the cervical and the lumbodorsal area was restricted. And there were no restrictions on the pectoral fascia.

Conclusion of palpation examination

According to these examinations hypertonus was found in the upper part of m. trapezius, m. levator scapulae bilaterally, on m. pectoralis major & minor bilaterally, on m. suboccipitals and in all rotator cuff muscles. Trigger points are present in the upper part of m. trapezius, m. levator scapulae on both sides and on suboccipitals muscles.

Hypotonus was also found on m. biceps brachii, m. deltoideus on the left side, m. gluteus maximus on both sides and on m. rectus abdominis, m. transverse abdominis, and m.oblique abdominis (internal & external). In the other hand there was hyper tonicity of latisssimus dorsi, and erector spinae symmetrically. Hyperalgesic skin zones and adhesion of the connective tissue were found in the upper part of m. trapezius.

3.2.7 Muscle strength tests

The muscle strength tests were provided according to *F.P.Kendall* (12)

Table: 12a, 12b Muscles strength:

(a)

Dx		**Sin**
4	m. deltoideus	3
4	m. biceps brachii	3
4	m. triceps brachii	4
	m. trapezius	
4	upper part	4
3	middle part	3
3	lower part	3
3	m. rhomboideus	3
3	m. serratus anterior	3

(b)

m. sternocleodomastoideus bilaterally	4
m. scalenii bilaterally	3
m. rectus abdominis	3

⌂ all the other part of upper extremity are with normal ***grade 5.***

Basic functional tests for hand

A. Fine, precise grasp

1. Pincers-grasp with 2 fingers: negative* both sides (*patient can perform it without problem).

2. Pinch-grasp with 3 fingers: negative on both sides

3. Lateral-grasp-grasp between 2nd finger and ulnar aspect of thumb: negative on both sides.

B. Power grasp

1. Grasp of the ball: negative on both sides
2. Hook with weight loading: negative on both sides
3. Grasp cylinder as far as hand to clenched: negative on both sides

Conclusion of muscle strength test

Weakness of left m.deltoideus, m.biceps brachii, middle and lower part of m. trapezius, on both sides, m. rhomboideus on both sides, m. serratus anterior on both sides.

3.2.8 Muscles shortening tests

The muscle shortening tests was provided according to *Vladimir janda* (10).

Table: 13a, 13b: muscle shortening:

(a)

m. erector spina cervicothoracal part bilaterally	2
m. sternocleodomastoideus bilaterally	0
m. scaleni bilaterally	0

(b)

Dx.		**Sin.**
2	m. trapezius upper part	2
2	m. levator scapulae	2
1	m. pectoralis minor	2
1	m. pectoralis major	2
1	m. illiopsoas	1

Conclusion from muscle shortening examination

According to these tests shortening is present in m. trapezius upper part on both sides, m. levator scapulae on both sides, m. pectoralis minor & major on both sides, m. suboccipitals, m. erector spinae and m. Illiopsoas.

3.2.9 Joint play examination

The joint play examination is performed according to Karel Lweit. (13)

Table: 14 Joint play examinations:

Atlanto-Occipital	No restriction
Cervical part of spine	Restriction of joint play in C5-C6, on the level of latero-lateral direction
C-Th crossing	Restriction of joint play in left lateral direction
Acromio-Clavicular joint	No restriction on both sides
Sterno-Clavicular joint	No restriction presents on both sides
Shoulder joint	Restriction of left shoulder in Ventro-dorsal direction
Scapulo-thoracic joint	No restriction on both sides
Ribs	No restriction on both sides
Elbow	No restriction on both sides
Wrist & (Carpal joint)	No restriction on both hands.

Before the examination of joint play: Isometric contraction against resistance was provided in all head movements (flexion, extension, latero-flexion, rotation), in all movements of both shoulder joints (flexion, extension, abduction, adduction, internal & external rotation) and in movements of both elbow joints (flexion, extension). The isometric contractions were provided in order to find if there are muscles lesions. The results are all **negative**.

Conclusion of initial kinesiology examination:

The comparison of the entire separate conclusion leads me to these results:

Neurological defects on the left thumb and lengthwise the C5-C6 dermatome. (see the table TOUCH) on the left side and hyporeflexia of biceps brachii and brachioradialis reflex (see table reflexes), on the left side, in relationship with muscle weakness and hypotonus of m. biceps brachii (see table palpation) can be caused by a cervical radiculopathy in C5-C6 level (C6 nerve root). Also, the presence of joint block in this level C5-C6 reinforces this differential diagnosis.

The imbalance in the following pairs of muscles:
Weak lower and middle trapezius and, rhomboid, short upper trapezius and levator scapulae.

1. Weak deep neck flexors and short m. suboccipitals.
2. Weak m. serratus anterior and short pectoral group is sing of upper cross syndrome according to *Vladimir janda.*

The forward-drawn head position and the downward shift of the cardiothoracic junction is a caused of cervicobrachial syndrome according to *Liebenson g.*

The restriction of ROM in all the functional movements of the left shoulder joint (see the table) can be caused by structural problems in this joint, according to *Miroslav Tichy.* In this case X-ray images. Also show arthrosis (structural problem), that is present on the left shoulder.

The spasm of the rotator cuff muscles (see table) and the abnormal scapulohumeral movement (pathological BMP on shoulder abduction) can be caused by vertebral joint problems, especially C5 and C6, according to *Grieve & Newman.*

3.3 Short term and long term rehabilitation goal and plans:

Short term:

The goal of short term rehabilitation plan for my patient will be:

- Decrease the pain.
- Relaxation of shortening muscles.
- Remove joint block from the shoulder and cervical part of spine.
- Increasing of muscles power of weak muscles.
- Increasing the range of motion of the restricted joints.
- Instructing the patient for good posture during sitting and sleeping.
- Instructing the patient how to provide correct auto therapy exercises.

For reaching these goals we could use a various kind of techniques.

From the spectrum of physical therapy we can use Trabert, Interferential or Diadynamic currents.

From the relaxation techniques we can provide post isometric relaxation (PIR), propioceptive neuro muscular facilitation (PNF), soft tissue technique.

In case of restricted joint play we can apply manual techniques (mobilization).

For strengthening muscles we can apply PNF, exercise with Theraband or Gym ball.

For reeducation of stereotype we can use the technique (PNF) , Sensomotoric stimulation, Gym ball.

Long term:

- Maintain the muscles power.
- Maintain the range of motion.
- Improve the coordination between muscles.
- Improve the activity of daily living.
- Search for the primary cause of pain.
- Provide rehabilitation for the lower extremity.
- Sensomotoric stimulation
- Lose weight.

3.4 Rehabilitation

Indication for rehabilitation by medical doctor:

Relaxation of m.trapezius bilaterally, short extensors, m.m. pectoralis major & minor, and scaleni muscles. Soft tissue technique in the region of the cervical spine, mobilization of left shoulder, posture correction, back school.

The rest according to the kinesiologcal examinations.

First session: (16.01.2006)

- Full kinesiology evaluation.

Therapy:

- Posture correction in sitting position according to *Brugger.*
- Soft tissue technique in the region of the cervical spine & left shoulder and left arm.
- Electrotherapy: Interferential c: f=4000 Hz, primary amplitude modulation (AMP) 80Hz, Spectrum (SP) 70Hz, Sweep time (swt) 3 sec, contour (con.) 33%.one electrode on the left shoulder and one electrode on the cervical spine. Time 10 minutes. Step 2 minutes, intensity over threshold sensitivity.

Second session (18.01.2006)

Subjective finding: She feels quite fine, slept well, no changes in status.

Objective finding: Restriction in joint play in segments C5-C6 (latero-lateral direction) and on CTh crossing (lateral direction), and in left shoulder joint (ventro-dorsal direction). Shortening and hypertonus, m.trapezius upper part bilaterally, m.leavator scapule bilaterally, short extensors, m.pectoralis major & minor bilaterally.

Therapy:

- Joint play: on C5-C6 level in latero-lateral direction, on C-Th crossing lateral direction, in left shoulder joint Ventro-dorsal direction.
- Manual traction of cervical spine.
- Soft tissue techniques in cervical part of spine.

- PIR: on m. trapezius upper part, m. levator scapulae, m. suboccipitals, mm pectoralis major & minor, m. erector spinae-cervicothoracal region and m. sternocleodomastoideus bilaterally, mm. scaleni bilaterally.
- Posture correction in sitting position according to *Brugger.*
- Instruction of the patient for the optimal posture during some activities of daily living.
- Electrotherapy: Interferential c: f=4000 Hz, primary amplitude modulation (AMP) 80Hz, Spectrum (SP) 70Hz, Sweep time (swt) 3 sec, contour (con.) 33%.one electrode on the left shoulder and one electrode on the cervical spine. Time 10 minutes. Step 2 minutes, intensity over threshold sensitivity.

Effect of the therapy:

- We removed the blocks from C5-C6 (latero-lateral direction) and CTh crossing (lateral direction), we relaxed & stretched the muscles: m. trapezius upper part, m. levator scapulae, m. suboccipitals, mm pectoralis major & minor, m. erector spinae.

Third session (20.01.2006)

Subjective findings: The patient felt better after the last therapy, she felt "her head is lighter".

Objective findings: There were remaining shortening and stiffness of the muscles: m. Trapezius upper part, m. levator scapulae, m. suboccipitals, mm pectoralis major & minor, m. erector spinae.

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Therapy:

- Soft tissue technique in the cervical spine region.
- PIR: on m. trapezius upper part, m. levator scapulae, m. suboccipitals, mm pectoralis major & minor, m. erector spinae-cervicothoracal region and m. sternocleodomastoideus bilaterally, mm. scalenii bilaterally
- Active exercise of both shoulders.
- Reflex massage around the scapulae & upper trapezius.

- PNF for both upper extremities- With slow reversal-hold relax technique, II diagonal Flexion pattern for group of muscles (trapezius, supraspinatus, infraspinatus, teres minor, deltoideus middle part).
- Electrotherapy Interferential: c. f=4000 Hz, primary amplitude modulation (AMP) 80Hz, Spectrum (SP) 70Hz, Sweep time (swt) 3 sec, contour (con.) 33%.one electrode on the left shoulder and one electrode on the cervical spine. Time 10 minutes. Step 2 minutes, intensity over threshold sensitivity.

Instruction of patient for the auto-therapy program:

- Posture correction in sitting position according to *Brugger.*
- Ant gravitation relaxation (AGR) m. trapezius upper part, m. levator scapulae, m. suboccipitals, mm. pectoralis major & minor.
- Mechanical correction of cervical spine by retraction
- Auto-mobilization technique for C-Th crossing.
- Active movements of both shoulders in all directions in the limit of pain.

Effect of the therapy: We relaxed and stretched the muscles: m. trapezius upper part, m. levator scapulae, m. suboccipitals, m .m pectoralis major & minor, m. erector spinae.

Fourth session (23.01.2006)

Subjective findings: The patient felt good immediately after the last therapy, until the night when the pain started to appear and she was waking up from the pain.

Objective findings: The patient has pathological pattern of shoulder abduction and arm sinkinesis during gate was missing. There is still remaining stiffness of the muscles: m. trapezius upper part, m. levator scapulae, m. suboccipitals, mm pectoralis major & minor, m. erector spinae.

(NOTE: I think that she didn't feel good from the last session due to the reflex massage and I decided to change the therapy).

Therapy:

- Control how the patient provides the auto-therapy program.

- Mobilization of both scapulas in prone position and mobilization on the left shoulder joint in ventro-dorsal direction.
- PIR: on m. trapezius upper part, m. levator scapulae, m. suboccipitals, mm pectoralis major & minor, m. erector spinae-cervicothoracal region and m. sternocleodomastoideus bilaterally, mm. scaleni bilaterally
- PNF- for both scapulas; isolated exercise of scapula according to *Adler* (training movements: anterior elevation, posterior depression, posterior elevation, anterior depression).
- Exercise with thera-band for strengthening of m. rhomboideus, m. trapezius middle part and lower part
- Electrotherapy Interferential: c. f=4000 Hz, primary amplitude modulation (AMP) 80Hz, Spectrum (SP) 70Hz, Sweep time (swt) 3 sec, contour (con.) 33%.one electrode on the left shoulder and one electrode on the cervical spine. Time 10 minutes. Step 2 minutes, intensity over threshold sensitivity.

- Auto-therapy program stays the same from the last session.

Effect of the therapy:

The patient felt relaxed on both shoulders, the arm sinkinesis during gate improved, but the patient has to think about it and train it and continue on keeping it.

Fifth session (25.01.2006)

Subjective findings: She felt much better from last session comparing to all the other sessions I did before.

Objective findings: The stiffness of the muscles still remains and the stereotype of abduction is still not optimal.

Therapy:

- Mobilization of both scapulas in prone position and mobilization on the left shoulder joint in ventro-dorsal direction.
- PIR: on m. trapezius upper part, m. levator scapulae, m. suboccipitals, mm. pectoralis major & minor, m. erector spinae-cervicothoracal region and m. sternocleodomastoideus bilaterally, mm. scaleni bilaterally.

- Active exercise of both shoulders.
- PNF- for both scapulas; isolated exercise of scapula according to *Adler* (anterior elevation by technique slow reversal hold for serratus anterior, posterior depression by meaning of slow reversal hold for mm. rhomboidei and levator scapulae).
- PNF-with slow reversal hold technique, I. diagonal extension pattern for muscles (rhomboid major & minor, teres major).
- Electrotherapy Interferential: c. f=4000 Hz, primary amplitude modulation (AMP) 80Hz, Spectrum (SP) 70Hz, Sweep time (swt) 3 sec, contour (con.) 33%.one electrode on the left shoulder and one electrode on the cervical spine. Time 10 minutes. Step 2 minutes, intensity over threshold sensitivity.

- *Autotherapy exercise with thera-band for strengthening of mm. rhomboidi, m. trapezius middle part and lower part.*

Effect of therapy:

She feels good no remarkable changes in status.

Sixth session (26.01.2006)

Subjective findings: She feels good no great changes in her status, she is happy that the pain has decreased.

Objectives findings: The tonus of the muscles around the cervical region is still increased and the stereotype of abduction is still not optimal.

Therapy:

- Soft tissue technique in cervical region and the left shoulder.
- Manual traction of the cervical spine.
- PIR of external and internal rotators of the shoulder.
- PNF- for both scapulas; isolated exercise of scapula according to *Adler* (relaxation techniques contract relax in direction of posterior elevation and anterior depression, for m.trapezius and pectoralis minor).
- PNF-with slow reversal hold technique, I. diagonal extension pattern for muscles (rhomboid major & minor, teres major).

- Electrotherapy Interferential: c. f=4000 Hz, primary amplitude modulation (AMP) 80Hz, Spectrum (SP) 70Hz, Sweep time (swt) 3 sec, contour (con.) 33%.one electrode on the left shoulder and one electrode on the cervical spine. Time 10 minutes. Step 2 minutes, intensity over threshold sensitivity.
- *Autotherapy exercise with thera-band for strengthening of mm. rhomboideus, m. trapezius middle part and lower part.*

Seventh session (27.01.2006)

-Final initial kinesiologcal examination

3.5 Final kinesiology examination:

Standing evaluation

Table: 15 Standing evaluation-anterior view:

Sole weight bearing	Symmetrical
Flat transversal sole arch	Normal
Flat longitudinal sole arch	Positive dex, sin.
Symmetry of calf (tibial side)	Symmetrical
Symmetry of calf (fibula side)	Symmetrical
Patella, knee	Valgoid knee. Bilaterally External rotation: 0 Internal rotation: 0
Symmetry of thigh contour	Symmetrical both sides(medio-later)
Anterior superior iliac spine	Symmetrical
Umbilicus	Slight deviation sin
Sternum	Middle line
Nipples	Symmetrical
Clavicles	Symmetrical
Shoulder position	Slight depression on dex. Dominant hand: dex.
Head position	Middle line

Table: 16 Standing evaluation- posterior view:

Heel form and position	Symmetrical
Achilles tendon contour	Symmetrical
Achilles tendon thickness	Symmetrical
Calf	Symmetrical
Popliteal lines	Symmetrical
Symmetry of thigh contour	Symmetrical in both sides(medio-later)
Subgluteal lines	Symmetrical
Posterior superior iliac spine	Symmetrical
Ileum crests	Symmetrical
Trunk latroflexion	Dextro concave
Symmetry of spinous processes	Symmetry of the whole spine is without any deviations
Inferior scapula angles	Lower dex
Scapulas medial margin scapula alata	**Symmetrical-Improved** **Negative-Improved**
Shoulder position	Slight depression of dex
Auricles	Symmetrical

Table: 17 standing evaluation-side view:

Knee joint position	Hyperextension dex. Hyperextension sin.
Position of pelvis	Anteversion
Lumbar part of spine	Hyperlordosis the peak is (L2-L3)
Thoracic part of spine	Hyperkyphosis the peak is (Th7-Th8)
Shoulder position	**Normal-Improved, bilaterally**
Cervical part of spine	**Slight hyperlordosis-Improved**
Head position	**Slight-protraction-Improved**

Examination of basic movement pattern:

Trunk curl up: pathological.

Pathological sign: Curling movement of the trunk is minimal and the movement performed with an almost straight back and **anterior** tilting of pelvis. The movement performed by the hip joint.

Head flexion: **Improved**

The head shift normally forward and the neck follow.

Shoulder abduction: **Improved.** m. supraspinatus, m. deltoideus and lastly the activation of m. upper trapezius.

Push up: **Slight improvement.**

The scapula stabilizers were fixed. Scapula alata still exists.

Goniometry

Table: 18a, 18b, 18c, 18d, 18e: Goniometry of active movement:

(a):

Dx.	**Shoulder joint**	**Sin.**
180°	Flexion	170 **Improved 10°**
60°	Extension	40° **Improved 10°**
180°	Abduction	130° **Improved 30 °**
0	Adduction	0
90°	Internal rotation	90° **Improved 20°**
90°	External rotation	90°

(b):

Dx.	**Head rotation**	**Sin.**
40°	Latroflexion	40°
70° Improved 10°	Rotation	70° **Improved 10°**

(c):

Head Flexion	30° **Improved 5°**
Head Extension	----------

(d):

Dx.	**Elbow joint**	**Sin.**
140°	Flexion	140°
0	Extension	0

(e):

Dx.	**Wrist**	**Sin.**
70°	Extension	70°
80°	Flexion	80°
45°	Ulnar deviation	45°
20°	Radial deviation	20°

Neurological examinations:

Upper extremities

Table 19: Superficial sensation

Touch	Without pathological findings, same sensation in both sides
Hot	Without pathological findings, same sensation in both sides
Cold	Without pathological findings, same sensation in both sides
Tactile	**Without pathological findings-Improved**
Dermatolexy	**Without pathological findings-Improved**

Table 20: Deep sensation

Vibration	Without pathological findings, same sensation in both sides
Sensation of position	Without pathological findings.
Sensation of movement	Without pathological findings.

2-Point-discrimination test:

Positive Left upper extremity, she wasn't able to distinguish one point or two points on her left upper extremity.

Numbering test:

Negative, she was able to distinguish the numbers even the alphabetic draws.

Position of the arms: Negative, she was able to know where her hands.

Mingazzini test of the arms (pseudo root pyramidal): Negative, she was able to hold her hands.

Table 21: Tendon reflexes:

Biceps brachii reflex	**Normal (3)-Improved (left upper extremity)**
Triceps brachii reflex	**Normal (3)-Improved (left upper extremity)**
Brachioradialis reflex	**Normal (3)-Improved (left upper extremity)**
Pronator reflex	**Normal (3)-Improved (left upper extremity)**
Flexion of fingers reflex	**Normal (3)-Improved (left upper extremity)**

The right upper extremity is normal without any pathological findings.

Lower extremities:

The neurological examination of lower extremities had no pathological findings, no neurological defects were present.

Pathological reflexes:

Pathological reflexes are not present.

Muscle strength test:

Table 22a, 22b: Muscles strength:

(a):

Dx		**Sin**
4	m. deltoideus	**4-Improved**
4	m. biceps brachii	**3+ Improved**
4	m. triceps brachii	4
4 **4 Improved** **4 Improved**	m. trapezius Upper part Middle part Lower part	4 **3+ Improved** **3+ Improved**
4 Improved	m. rhomboideus	**3+ Improved**
4 Improved	m. serratus anterior	**3+ Improved**

(b):

m. sternocleodomastoideus bilaterally	4
m. scalenii bilaterally	**3+ Improved**
m. rectus abdominis	3

⌂ all the other part of upper extremity are with normal ***grade 5.***

Muscles shortening tests

The muscle shortening tests were provided according to *Vladimir janda.*

Table 23a, 23b: Muscle shortening test:

(a):

m. suboccipitals	**0 Improved**
m. erector spine- cervicothoracal part bilaterally	**1 Improved**
m. sternocleodomastoideus bilaterally	0
m. scaleni bilaterally	0

(b):

Dx.		**Sin.**
1 Improved	m. trapezius upper part	**1 Improved**
1 Improved	m. levator scapulae	**1 Improved**
0 Improved	m. pectoralis minor	**0 Improved**
0 Improved	m. pectoralis major	**0 Improved**
1	m. illiopsoas	1

Palpation examination

Table 24a, 24b, Palpation examination:

(a):

Dx.		**Sin.**
Normotonus No-Trigger points (TrP)	m. trapezius upper part	**Normotonus No-Trigger points (TrP)**
Normotonus	middle part	Normotonus
Normotonus	lower part	Normotonus
Normotonus	m. biceps brachii	**Normotonus**
Normotonus	m. sternocleodomastoideus	Normotonus
Normotonus, No-TrP-Improved	m. levator scapulae	**Normotonus , No-TrP-Improved**
Normal tonus	m. deltoideus	**Normotonus-Improved**
Normotonus-Improved	m. pectoralis minor	**Normotonus-Improved**
Normotonus-Improved	m. pectoralis major	**Normotonus-Improved**
Normotonus	m. teres minor	**Normotonus-Improved**
Normotonus	m. supraspinatus	**Normotonus-Improved**
Normotonus	m. infraspinatus	**Normotonus-Improved**

Normotonus	m. subscapularis	**Normotonus-Improved**
Hypotonus	m. gluteus maximus	Hypotonus
Hypertonus	m. erector spine	Hypertonus
Normal tonus-Improved	m. latisssimus dorsi	**Normotonus-Improved**

(b):

m. suboccipitals	**Normotonus- No TrP. Improved**
m. rectus abdominis	Hypotonus
m. transversus abdominis	Hypotonus
m. obliqus abdominis (internal & external)	Hypotonus

Skin drag examination: No hyperalgesic zones (HAZ) were found in the upper part of m. trapezius, m. levator scapulae and m. suboccipitals **(Improved).**

Connective tissue examination: During the examination of connective tissue of the whole back and cervical area, **no adhesion** of the connective tissue in the upper part of m. trapezius was found **(Improved).**

Examination of fascia: During the examination the restriction and adhesion of the cervical region and the lumbosacral region disappeared.

Joint play examination

Table 25: Joint play examination

Atlanto-Occipital	No restriction
Cervical part of spine	**No restriction is present-Improved**
C-Th crossing	**No restriction is present-Improved**
Acromio-Clavicular joint	No restriction on both sides

Sterno-Clavicular joint	No restriction presents on both sides
Shoulder joint	**Slight restriction of the left shoulder is present-Improved in Ventro-dorsal direction**
Scapulo-thoracic joint	No restriction on both sides
Ribs	No restriction on both sides
Elbow	No restriction on both sides
Wrist & (Carpal joint)	No restriction on both hands.

3.6 Therapy effect evaluation:

- According to the final kinesiologcal examination large improvements were visible. The posture examinations show that the position of scapulae, head and cervical part of spine improved (see the tables) the basic movements patterns of head flexion, shoulder abduction and push up improved slightly.
- The range of motion on the left shoulder joint and head improved slightly as well.
- The strength of left m. deltoideus, left m. biceps brachii, middle and lower part of m.trapezius (both sides), m. rhomboideus (both sides), m. serratus anterior (both sides) and m. scaleni, increased (see table).
- The length of the upper part of m. trapezius (both side), m. levator scapulae (both sides), mm. pectoralis minor and major (both sides), m. suboccipitals increased (see the table).
- The examination of the skin and connective tissue shows that no HAZ and connective tissue adhesion exist on the upper part of m. trapezius after the therapy.
- The mobility of cervical part of spine and C-Th crossing improved according to the joint play examination (see table).

4. Discussion and prognosis of the patient

The prognosis of the cervicobrachial syndrome in this case is improved and in a very good stage, and if the patient will continue with the therapy and autotherapy with the same frequency. We will expect a rehabilitation success.

The patient improved her stage due to her cooperation with the therapy, and she has an aim to relive the pain, she still needs more effective therapy.

Due to the main problem and the medical doctor recommendation I concentrated on the cervicobrachial pain, if I had enough time I would concentrate on the lumbar spine and lower extremity. Because I suspect that the primary cause of the pain is originate from the lower part, with respect to the patient obesity, its influence the lower part.

And I would reconsider a deep stabilization system therapy.

Lastly I would like to thank my patient Mrs. L.K. for her cooperation and positive mood, from the first session she trusted me and followed my instructions in the hospital and home, perfectly without her indispensable help , I will not be able to fulfill my thesis goals.

5. Conclusion

I am extremely pleased, because I fulfill two main goals of my thesis. And I proved that I can use the physiotherapeutic knowledge that I have gained through my studies at Charles University at the faculty of physiotherapy and sport in Prague.

The most important is that I proved that physiotherapy is an important field in medicine or so called a "medical allies". We are able to heal the patient after serious complications through there lives and we are able to help the patient to get back to there life without any aids from any person.

As well that we are able to reduce the pain that the symptoms or the syndrome gave the patient, through the physiotherapy and very importantly the psychological knowledge that we gain through our studies such as psycho-relaxation techniques.

Further more I would like to acknowledge that I wasn't able to re-heal totally the pathological syndrome or remove the pain due to the degeneration of the C5-C6 cervical spine and due to the stenosis. But I am glad that there was an improvement in the patient case as well improvement of the muscles and the stage.

It was very interesting the fact how the human body works, the therapeutic effect started and the patient start to feel better due to the psychological effect and that she is getting the treated, even though I am still a student, the patient still believed in me and she brook the barriers between me as a therapist and her as a patient. Especially with the pressure I was under due to my very first independent experience in a clinical procedure. I saw the improvement that the patient gained. In the 14 days the cervicobrachial syndrome was slightly better and the kinesiologcal initial examinations showed that the patient improved. This kept me satisfied with the decision and the right treatment that I chose with thanks to my supervisor at the hospital and the supervisor at the school.

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